4.4 Modelling Quadratics Using Vertex Form

1) Sketch the parabola, if possible

2) Identify the key properties

3) Sub vertex (h, k) into $y = a(x - h)^2 + k$
   - if vertex is not given, use symmetry

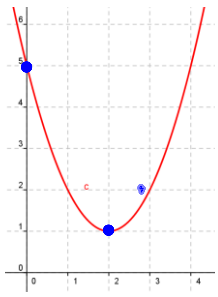
4) Sub any other point to find a

5) Does your answer make sense?

$y = 3x^2 + 4$

Apr 18-3:11 PM

Ex.1. Determine the equation in vertex form.



$y = a(x-h)^2 + k$

$y = a(x-2)^2 + 1$

Vertex (2, 1)

y-intercept (0, 5)

sub (0,5) to solve

$5 = a(0-2)^2 + 1$

$5 - 1 = a(-2)^2$

$\frac{4}{4} = \frac{4a}{4}$

$a = 1$

$\boxed{y = (x-2)^2 + 1}$

Apr 22-8:51 PM

Ex.2 State the equation of the parabola obtained by applying these transformations to the graph of $y = x^2$.
- a vertical stretch by a factor of 5
- a vertical shift of 9 units

5, 15, 25

positive = up

$y = 5x^2 + 9$

$y = -5x^2 + 9$

(reflected in the x-axis)

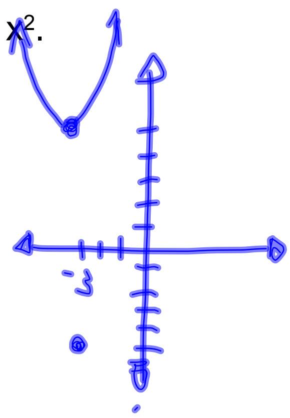
Not there!

Apr 22-9:09 PM

Ex.3 Write an equation for the parabola that has a vertex at (-3, 5), no zeros, and is wider than $y = x^2$.

Vertex (-3, 5)

no zeroes



$y = a(x+3)^2 + 5$

compression

$a < 1$

$a \neq 0$

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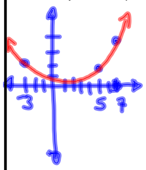
Ex.4 Find the equation of the quadratic that passes through the points (-3, 2), (5, 2) and (7, 4).



$$AOS = \frac{5+(-3)}{2} = \frac{2}{2} = 1$$

$y = a(x-1)^2 + k$

sub (-3,2)

$2 = a(-3-1)^2 + k$

$2 = a(16) + k$

$-16a + 2 = k$

① $\boxed{k = -16a + 2}$

~~sub (5,2)~~

$\cancel{2 = a(5-1)^2 + k}$

sub (7,4)

$4 = a(7-1)^2 + k$

$4 = 36a + k$

$-36a + 4 = k$

② $\boxed{k = -36a + 4}$

Substitution

$-36a + 4 = -16a + 2$

$-36a + 16a = 2 - 4$

$\frac{-20a}{-20} = \frac{-2}{-20}$

$a = \frac{1}{10}$

sub in

$\boxed{k = 0.4}$

∴ the equation in vertex form is

$y = \frac{1}{10}(x-1)^2 + 0.4$

Apr 22-9:25 PM

Assigned Work: p. 280 # 1, 2ace, 3ace, 4, 5ace, 6cd, 7b, 8 (w/ diagram), 10, 15